

**SCHOOLBAG WEIGHT AND LOW BACK PAIN
AMONG PRIMARY SCHOOLCHILDREN IN LIPIS
PAHANG**

by

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Specially Dedicated For

My Wife

Hasnani binti Mamat @ Muhamad

My Kids

Hafizi Ikhwan

Hazimi Ilham

Hamizi Irfan

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ABSTRAK

Di Malaysia, harapan kepada pelajar mendapat kejayaan akademik yang tinggi semakin meningkat sejak kebelakangan ini. Semua pihak iaitu ibubapa, pihak pentabiran sekolah, guru-guru termasuklah pihak kerajaan memberi penekanan yang berat terhadap kejayaan para pelajar. Kanak-kanak sekolah juga terpaksa berhadapan dengan peningkatan di dalam kurikulum, ko-kurikulum serta kelas tambahan selepas waktu sekolah yang secara tidak langsung membuatkan berat beg sekolah kanak-kanak ini semakin bertambah. Didalam kajian ini objektif utama adalah untuk menentukan berat beg sekolah yang di bawa oleh pelajar serta menentukan nisbah di antara berat badan mereka dengan berat beg. Keduanya adalah untuk menentukan prevalen sakit belakang di bahagian bawah dan kaitannya dengan berat beg yang dibawa. Kajian hirisan lintang ini dijalankan di Daerah Lipis yang melibatkan seramai 889 pelajar sekolah rendah dari Tahun 1 hingga Tahun 5. Ukuran ketinggian, berat badan dan berat beg sekolah setiap pelajar diambil. Para pelajar ditanya menggunakan borang temuduga berpandu. Keputusan menunjukkan purata berat beg mereka adalah 4.5 kg (95 % CI: 4.4kg, 4.6kg). Di dalam peratusan berat badan pula puratanya adalah 17.8 % (95 % CI; 17.4%, 18.2%). Terdapat 90.0% daripada pelajar yang membawa berat beg melebihi 10.0% dari berat badan. dan kira-kira 62.9% membawa berat beg melebihi 15.0% dari berat badan. Jenis sekolah, tahap tahun belajar, jenis beg yang digunakan dan mengikut jadual adalah faktor yang didapati mempengaruhi berat beg sekolah. Terdapat juga 15.9% pelajar yang menggunakan beg jenis beroda tetapi 80.9% masih mengalas beg beroda

mereka. Prevalen satu bulan sakit belakang di bahagian bawah adalah 14.1% (95 % CI; 11.8%, 16.4%). Kira-kira 65.8% dari mereka memberi tahu ibubapa mereka tentang sakit belakang, 31.2% tidak hadir ke sekolah kerana sakit tersebut dan 33.6% mendapat rawatan untuk mengurangkan kesakitan tersebut. Kita tidak dapat membuktikan secara signifikan kaitan di antara berat beg sekolah dengan sakit belakang pelajar di bahagian bawah. Kajian ini dapat menunjukkan bahawa isu pelajar membawa bag yang berat ke sekolah adalah terbukti dan sejarah sakit belakang di bahagian bawah memang wujud pada pelajar dan prevalennya adalah tinggi. Walaupun kaitan di antara sakit belakang di bahagian bawah dan berat beg tidak dapat dibuktikan didalam kajian ini, pelajar sekolah serta ibubapa mereka patutlah dibekalkan dengan informasi serta tunjukajar berkaitan had berat yang dicadangkan untuk beg sekoah serta kesan kesihatan kepada pelajar jika membawa beg berat.

Abstract

In Malaysia, there are increasing higher expectation of school children's academic performance with parents, school authorities, teachers, media, politician and government placing greater emphasis on examination results of schoolchildren and schools. Children are facing heavier school curriculum and co-curriculum, and may lead to more schoolbooks and school equipment needed, thus increasing their schoolbag weight that may caused them to experience low back pain (LBP). The primary objective of this study was to determine the schoolbag weight and their ratio with schoolchildren body weight among primary schoolchildren in Lipis, Pahang. The second objective was to determine the prevalence of low back pain among these school children and its association with schoolbag weight. This was a cross sectional study conducted at Lipis District involving 889 primary school children from Primary 1 to Primary 5 conducted from September to November 2005. Each schoolchildren's height, body weight and backpack weight were measured. All the information was gathered by using a guided questionnaire and analyzed using SPSS software version 10.0. The results showed that the mean schoolbag weight was 4.5 kg (95 % CI: 4.4 kg, 4.6 kg). In percentage of body weight the mean was 17.8% (95 % CI: 17.4%, 18.2%). About 90.0% of these schoolchildren carried schoolbag weighing more than 10% of their body weight and 62.9% of them carried backpacks more than 15 % of body weight. The type of school, grade level, type of backpack use and following the school's timetable were significant factors influencing the weight of the schoolbag. Wheeled backpack was used by 141

(15.9%) of the schoolchildren but 114 (80.9%) of them still carried the bag on their back. The one-month prevalence of low back pain (LBP) was 14.1% (95 % CI: 11.8%, 16.4%). About 65.6% of the schoolchildren informed their parents about the pain, 31.2% had to miss school because of the pain and 33.6% of them had to seek treatment for the pain. The relationship between the LBP and backpack weight was not significant. In conclusion, concerns that schoolchildren carrying heavy schoolbag were justified. LBP report did exist among primary schoolchildren and the prevalence was high. While the evidence of relationship between LBP and schoolbag weight was still inconclusive and need further elucidation, the schoolchildren and their parents should be provided with information and guideline regarding the schoolbag load limit and the effect of heavy schoolbag to their health.

CHAPTER 1

INTRODUCTION

In recent years there are increasing higher academic expectation of Malaysian schoolchildren. All parties including parents, school authorities, media, politician, teachers and government, placing greater emphasis in examination result of the schoolchildren and schools. Children are now facing increasing curriculum load, co-curriculum and after school activities. A consequences is that the schoolbag of the schoolchildren are becoming heavier and may lead to several health effect such as low back pain (LBP), which something not recognized by their parents.

Forjough S.N. *et al* (2003) conducted a study among 1327 schoolchildren (aged 5 to 12 years old) that came from 3 different schools, in Texas, Unite State (U.S). They found that the average schoolbag weight was 2.6 kg and average schoolbag weight to student weight ratio was 8.2% (95% CI: 7.8%, 8.5%). The mean schoolbag weight among kindergarten children was 1.3 kg and average schoolbag weight in percentage body weight was 6.2% while among Grade 5 was 4.8 kg with average schoolbag weight to student weight ratio was 12.0%. About 26.0 % of the students carried schoolbag weighing at least 10.0 % of the body weight. They also found that the mean schoolbag weight increased significantly with higher grade level and varied significantly by school, backpack type, day of the week, Body Mass Index (BMI), and race or ethnicity. Goodgold S. *et al* (2002) conducted a study among 345 children from Grade 5 through Grade 8 (176 girls and 169 boys, aged 11 to 14 years) in Massachussetts, U.S. They found that the

younger children carried proportionally greater schoolbag load in percentage of body weight (Grade 5 carried mean of 19.0 %, Grade 6 carried 21.0 %, Grade 7 carried 14.0 % and Grade 8 carried 15.0 % of body weight respectively). The researchers also identified that 55.0 % of the children carried backpack weight greater than 15.0 % of their body weight. Negrini S. *et al*, (1999) in Italy reported that average load carried by the students was 9.3 kg (22% of body weight) and 34.8 % of them carried more than 30.0 % of their body weight.

Presently, there is no official schoolbag weight limit for application in school. However most of the professional bodies such as American Physical Therapy Association (APTA), American Academy of Pediatric (AAP) and American Occupational Therapy Association (AOTA) proposed that the recommended weight limit for children is between 10.0% to 15.0% of the child's body weight.

Some of the adverse effects to children from carrying heavy backpacks are:

1. Low back pain.
2. Back related complaint such as neck, shoulder, back pain, ache or stiffness.
3. Backpack related injury like fall or tripping

Low back pain is the focus of this study due to the fact that back pain in children and adolescents results in severe, chronic LBP in adult life (Olsen *et al*, 1992). Jones G.T and Macfarlane G.J. (2005) in their review article, concluded that LBP is rarely associated with serious pathology, but majority of the children have mild, non-specific and self-limiting symptom that rarely result in medical consultation.

However there are evidence that the LBP in schoolchildren tend to recur and some of the schoolchildren that reported LBP also reported some form of disability (Watson K.D. *et al*, 2002; Kovacs F.M *et al*, 2003; Siambanes D. *et al*, 2004). It has been shown that a strong predictor of having future back pain is a previous history of such symptom (Troup *et al*, 1987). In a sample of 3498 students from two counties in Southern California, U.S, Siambanes D *et al*, (2004) found the non-specific mechanical back pain highly prevalent (lifetime prevalence 64.0%) and severity and chronicity of pain among these students was high. About 16.1% of the students indicated that they have missed school, gym class or after school sports because of the pain. While 16.9% of them had been to a doctor for the back pain. About 21.0% of the schoolchildren experienced the pain for over than 6 months. The researchers also concluded that the backpack weight measured in the percentage body weight was effective in predicting the back pain after controlling for age, socioeconomic status, walking to and from school, and method of wearing. In a study of Italian school children, it was found that 79.1 % felt their bag were too heavy, 65.7 % reported fatigue and 46.1 % complained of back pain (Negrini S. and Carabalona R., 2002).

In Malaysia, the issue of heavy schoolbag carried by schoolchildren has frequently highlighted by the media since 1996, resulting in mixed reaction among parents, academicians and the government. This is mainly because we have a minimal information on how much schoolbag weight that our schoolchildren are carrying to school everyday. There was only one local study found that investigates the schoolbag weight and LBP among primary schoolchildren.

Tamrin S.B.M *et al* (2005) conducted a cross-sectional study of 84 schoolchildren from Primary 2 (P2) and Primary 5 (P5) aged of 8 and 11 years respectively in Sri Kembangan. The overall prevalence of LBP was 59.5%. The prevalence of LBP among P5 schoolchildren was higher (64.3%) compared to P2 (54.8%). They also found 58.3% of the schoolchildren reported having experienced LBP while carrying their schoolbags. The authors also concluded that age of the schoolchildren, family history of back pain, exposure to environment tobacco smoke, weight of the schoolbag and method of carrying schoolbag play important role as the risk factor for back pain.

At present, there is no prevention program to limit the weight of schoolbag and to create the awareness for the parents and schoolchildren that increasing heavy schoolbag may result in long-term health problem such as LBP. The purpose of this study was to look at the weight of the schoolbag carry by the primary school children and the prevalence of LBP in primary school children, in Lipis, Pahang. We want to determine the significance of the schoolbag weight, it's percentage of body weight with LBP of the primary school children. We also want to study the distribution of weight of items found in heavy schoolbag (backpack that weight at 15.0% of more of the child's body weight) such as the weight of the bag itself, text books, writing books and other equipment in the schoolbag.

CHAPTER 2

LITERATURE REVIEWS

2.1 Schoolbag and Schoolbag weight

Educational programs and policies have been shaped by culture, politics and economics as well as the technology available in the country. For hundreds of year print technology played a powerful role in shaping education and disseminating information. During the past decade the influence of information and communication technology (ICT) has been superimposed upon the traditional structure of education such as schoolbooks and classroom teaching. Despite the current trends, computers, CD-ROM and E-book via Internet at home still cannot fully replace the role of the printed material like textbook. Using schoolbags to carry books and school equipment are still important in the daily activities of schoolchildren. Most of countries in the world have adopted to increase academic and curricula standards. Increased emphasis on improving the quality of education as well as greater accountability on teachers and schools for achieving this goal, there has been an increased emphasis on homework for the past few years. More teachers are now giving more homework, thus requiring students to carry most of their schoolbooks to and from school on a regular basis (Association of American Publishers (AAP), 2003). Parents, school officials and health professionals have a growing concern with the increased amount of load that the children carry to school each day. Backpack carried by schoolchildren may be associated with several health consequences including back strain,

altered gait, bad posture and eventually low back pain. There are only a few studies published about the prevalence of backpack related problems but public concern about schoolchildren carrying heavy schoolbags or backpack has been expressed in many countries, including United States, Australia, India, Brazil, Poland, Hong Kong, Italy and Egypt (Forjuoh S.N. *et al*, 2003). Tamrin S.B.M. *et al* (2005) conducted a cross sectional study on Primary 2 and Primary 5 schoolchildren in Sri Kembangan, Selangor and found that the schoolbag carried by Primary 2 schoolchildren weighted an average of 3.7 kg and those carried by Primary 5 schoolchildren weighted an average of 5.5 kg. They also reported that the average load carried by both Primary 2 and Primary 5 schoolchildren was 15.0% of body weight with Primary 2 schoolchildren carried significantly lighter schoolbag weight compared to Primary 5 schoolchildren. However the authors did not reported the number of schoolchildren that carried above 15.0% of body weight. Casey G. and Dockrell S. (1996) reported the average schoolbag weight carried by 10-year-old Irish schoolchildren was 5.2 kg with 56.0% of them carried schoolbag weight more than 15.0% of the body weight. While Forjuoh S.N *et al* (2003) reported that the mean schoolbag weight carried by schoolchildren in Taxes, U.S (aged 5 to 12 years old) was 2.6 kg and the average percentage of body weight carried was 8.2%. About 26.0% of the schoolchildren carried a schoolbag more than 10.0% of body weight. Negrini S. *et al* (1999) validated the magnitude of the schoolbag problem. The authors followed 237 Grade 6 schoolchildren in Bresso, Italy for 3 weeks and found that the average daily load carried by the schoolchildren was 9.3 kg, and the average percentage of body weight carried was 22.0%. About 34.8% of the schoolchildren carried schoolbag

weight more than 30.0% of their body weight at least once during the week. Negrini and colleagues advice that the time has come to propose the pediatric schoolbag load limitation.

What causes the backpack to be heavy? Most of the studies on the backpack weight did not explore the contents of the schoolbag. What items or equipment that contributed to the overall weight of the schoolbag? The Advisory Committee on Textbook Specification, United State (ACTS) suggested that the cause of the “overweight schoolbag” was due to many factors and not directly to textbooks. Although the weight of paper can be reduced, it gives only 12% reduction in the weight of each textbook. Another problem of overweight schoolbag is because child carries most of the textbooks without following the timetable of the day. This is further complicated by the child other non-educational material such as extra clothes, make up, lunch and CD player. ACTS also felt that heavy schoolbag issue is related to elimination of lockers from schools because of security reason. As such, many schoolchildren have to carry their book to and from school and between classes. The American Physical Therapy Association (APTA) also found that one-third of the schoolchildren who have locker, do not use their locker. Grimmer K. and Williams M. (2000) found that non-educational materials contributed about 10.0% to 20.0% of the backpack weights. While Siambanes D. *et al* (2004) found that the non-educational materials that the schoolchildren carried in their backpack was 30.0% from the overall backpack weight. They also found that ‘two sets of textbooks system’ already implemented in 2 of the schools they visited but the system is not enforced. Another factor to consider is the lack

of knowledge and awareness among parents regarding their children's backpack weight. Forjuoh S.N. *et al* (2003) concluded that most parents (96%) had never checked their children's backpack weight while 34.0% had never checked the backpack contents. This may reflected that the awareness about heavy schoolbag problem still low in some of the parents.

2.2 The effect of carrying heavy schoolbag and schoolbag weight limit

Everyday schoolchildren have to use schoolbag in order to carry their schoolbooks and supplies. And most studies had show that carrying heavy schoolbag to school is common in schoolchildren. The child's body will adjust itself in order to accommodate the load that is put on the body. The effect of schoolbag load to schoolchildren is depend on the load that the child carry, the carrying method and the type or design of the schoolbag that is used to carry the load.

In children, the adjustment of trunk posture was found during level walking in order to cope with the increasing load (Hong and Brueggemann, 2000). Fong D.T.P. *et al*, (2004) studied the school bag weight combined with carrying method effect to the trunk posture laterally during stair descent. They found a significant load effect on the trunk posture when the load was increased from 0 % of body weight to 15 % of body weight when carrying an athletic bag compared to when the load was increased to 20% of body weight when carrying backpack. For loads 10%, 15% and 20% the backpack design significantly reduced the trunk posture

alteration compared with the athletic bag. The study showed that carrying a load using double strap backpack is the best method compared to athletic bag.

A study on backpack use that influence the gait cycle and posture in 10 and 11 years old children, Pascoe D.D. *et al*,(1997) found that improper carrying of a backpack by using only one strap will cause a significant elevation of the strap bearing shoulder and also lateral bending of the spine away from the weight of the bag. Mackenzie, W.G. *et al* (2003) in their review article of the available scientific literature reported that approximately three quarter of the children were carrying their backpack with one strap only. This improper backpack wearing may cause musculoskeletal stresses, which can result in back pain.

Hong Y. *et al* (2000) found that when children carried load between 15% to 20 % of their body weight, the blood pressure takes a longer time to return back to baseline. As a result the 10% of body weight are recommended for upper limit of backpack weight in children because it was not significantly different from carrying 0% of body weight load in the metabolic cost. Lai J.P. and Jones A.Y. (2001) conducted a study to investigate the effect of backpacks and spinal posture on pulmonary function on 43 Chinese schoolchildren (mean aged 9.6 year old). The results showed that backpack beyond 10.0 % body weight decrease the forced expiratory volume in the first second (FEV1) and forced vital capacity (FVC). This finding was similar went the children were asked to bend their body to assume a kyphotic posture.

Lind and McNicol (1968) investigating load carriage by hand and by shoulder harness. They noted that in hand carriage, the arm muscles involved were close to fatigue after 2.5 minutes while with the same load the shoulder muscles had not fatigued until after 15 minutes. Robertson R.J. *et al* (1982) demonstrated that load of 7.5 to 15 % of body weight can be carried without increasing metabolic cost beyond that which is required to move the human body alone. Malhotra and Sengupta (1965) compared different methods of carrying schoolbags. The rucksack method proved to be most economical and hand carriage to be the least economical in terms of energy expenditure. They also found that hand carriage caused marked side bending of the trunk and poor posture.

Presently, there is no official schoolbag weight limit for application in school. However, most of the professional bodies such as American Physical Therapy Association (APTA), American Academy of Pediatrics (AAP) and American Occupational Therapy Association (AOTA) proposed that the recommended weight limit for children is between 10.0% to 15.0% of the child's body weight.

2.3 Low Back Pain (LBP) in Children

Low back pain (LBP) which is a common complaint among adults has now become important among children. Interest in LBP among school aged children and LBP has increased exponentially, where a PubMed search retrieved only four references from 1970 to compared with 337 references for 1998-2001 (Balagué F. *et al*, 2003). Study of low back pain in this group is very important, as back

pain that occurs initially at this age may precedes the subsequent, severe, chronic back pain seen in adulthood (Olsen *et al*, 1992; Balaque F. *et al*, 1988).

Estimate of LBP prevalence in children and adolescents vary widely between studies, depending on the age of the study participants, and on methodology difference particularly in term of LBP definition. Kovacs F.M. *et al* (2003) commented in their review of population based studies that prevalence of non-specific LBP in children and adolescents vary from 7.0% to 63.0%. Viry P. *et al* (1999) showed that the prevalence of back pain from 123 students of Grade eight (mean aged 14 years old) was 27.6 %, whereas the cumulative prevalence for the last 12 months was 82.9 %. Prendeville K. and Dockrell S. (1998) found that the overall prevalence of LBP among 200 Irish schoolchildren between aged 13 to 17 years old was 41.5%. The LBP definition used was "an episode of LBP and/or discomfort that interrupted your normal daily activities and/or required you to seek treatment". While Taimela S. *et al* (1997) used "reporting pain at low back area that interfered with school work or leisure activities during the previous twelve months" as the LBP definition in the study of 1171 schoolchildren aged between 7 to 16 years old. The prevalence of LBP in both 14 and 16 years old schoolchildren was 18.0% while the prevalence in 7 year old was 1.0% and 10 years old was 6.0%. Watson K. D. *et al* (2002) conducted a cross-sectional study in secondary school in Cheshire and North Derbyshire, Northwest of England involving 1146 children aged 11 to 14 years old. The LBP definition was based on the location, duration and recall period. As proposed by the authors, by limiting the recall period to one month, the validity of LBP reporting will increased. They

found that the one-month prevalence of LBP was 24.0%. Sjolie A. N. (2004) conducted a 3-years prospective study among the eighth and ninth grades students in Eastern Norway (N=105, mean age 14.7 years old) reported the LBP at baseline was 58.0% and 39.0% at follow-up. About 31.0% reported LBP at both occasions. LBP of more than 7 days were reported by 32.0% of the students at baseline, by 26.0% at follow-up and by 16.0% at both occasion. The author concluded there was a persistent but changeable trend of LBP from mid-adolescence until late adolescence.

Jones G.T and Macfarlane G.J. (2005) in their review article, concluded that LBP is rarely associated with serious pathology, but majority of the children have mild, non-specific and self-limiting symptom that rarely result in medical consultation. Watson K.D. *et al* (2002) found that only 25.0% of students reported having LBP went for medical consultation. While Siambanes D. *et al* (2004) found that only 16.9% of the student reported back pain went to doctor. However there are evidence that the LBP in schoolchildren trend to recur and some of the schoolchildren that reported LBP also reported some form of disability. Watson K.D. *et al* (2002) reported nearly 94% of the students with LBP experienced some disability with the most common reports is being of difficulty to carry their schoolbags. Siambanes D. *et al* (2004) also found that 16.1% of the students reported LBP had missed school, gym class or after school sports because of the pain, 59.0% of students with LBP reported the recurrent LBP and 21.0% of them experienced the pain more than 6 months. Despite the limitation of the studies, LBP has been shown to exist among children and adolescents. It has been

shown that a strong predictor of having future back pain is a previous history of such symptom (Troup *et al*, 1987).

2.3.1 Schoolbag and low back pain in children

According to American Chiropractic Association (ASA), young children are suffering back pain much earlier than previous generation and the use of overweight backpack is a contributing factor. Siambanes D. *et al* (2004) found that the schoolbag weight measured in percentage of body weight was effective in predicting back pain after controlling for age, socioeconomic status, walking to and from school and method of wear. In cross sectional study of 1126 children, aged 12 to 18 years, Sheir-Neiss *et al* (2003) reported that adolescent with back pain were more likely to carry a heavier backpack and to use their backpack more during the school day. Adolescents without back pain were more likely to attend schools that banned carrying backpacks between classes. The authors concluded that the use of backpack during the school day and the backpack weights are independently associated with back pain. While study by Viry P. *et al* (1999) also reported that a schoolbag weight of 20.0% of child's body weight or more was associated with history of back pain (OR, 3.1; 95 % CI, 1.0, 9.2). In New Zealand study by Whittfield J. and Legg S. (1999) on 140 student (70 third form students and 70 sixth form students). Third form students were found to carry backpack weighing 13.2% of their body weight, while sixth form students carried backpack weighing only 10.3% of their body weight. Musculoskeletal symptom were reported by 77.1% of the students and were most prevalent in the neck (44.3 %), bilateral shoulders (43.6 %), upper back (36.4 %) and lower back (35.0 %). More

sixth form (42.9 %) reported pain in their lower back than third form students (27.1 %). The American Academy of Orthopedic Surgeons conducted a survey among 101 doctors found that 58% of the orthopedists reported had seeing schoolchildren with back or shoulder pain and related the symptom to their backpacks. More than 70.0% of the orthopedists surveyed indicate that heavy backpacks can become a clinical problem in schoolchildren, and efforts to be directed at decreasing the weight of the backpacks carried.

However some studies had showed the opposite results. Goodgold S. *et al* (2002) reported that the load carried by schoolchildren in percentage of body weight was not significantly related to the history of back pain. Watson K.D *et al* (2003) collected data on actual schoolbag weight over 5-day period and computed the average daily mechanical load. They found that the schoolchildren with the heavies' load (6.4 to 18 kg) were no more likely to report LBP than the children with lighter load (less than 3.5kg). A prospective study by Jones *et al* (2003) also showed the similar result. They follow 933 schoolchildren that are known to be free from LBP at the baseline. These authors showed that schoolbag weight at baseline was not associated the risk of LBP in the follow up. Children carrying load 6.4 to 18 kg experienced no significant increase in risk compared to those carrying schoolbag weight less than 3.4 kg (RR=1.2; 95% CI, 0.7, 2.1).

2.3.2 Other risk factors for low back pain in children

Beside the heavy mechanical load such as heavy schoolbag that may be related to LBP in schoolchildren, researchers have identified a few risk factors that may be associated with LBP.

There is a difference in reporting LBP between gender. Female schoolchildren were more likely to report LBP compared to male schoolchildren. Watson K.D. *et al* (2002) found that one-month prevalence of LBP was higher in girls (29.0% vs. 19.0%; chi square = 14.7, p value <0.001). Viry P. *et al* (1999) also showed that female gender was associated with current back pain (odd ratio (OD)= 2.7; 95% CI: 1.2, 6.1). Similar association also found in other studies (Kovacs F.M *et al*, 2003; Siambanes D. *et al*, 2004). In contrast, however Taimela S. *et al* (1997) reported that there was no significant difference between gender.

A few studies found that the occurrence of back pain in children increases with age. Taimela S. *et al* (1997) reported that the prevalence of LBP was 1.0% in children 7 years old, 6.0% in children 10 years old and 18.0% in children 14 years old. Burton A.K. *et al* (1996) reported that the prevalence of LBP was 11.6% for 11 years old children but increased to 50.4 % for 15 years old children. And Watson K.D. *et al* (2002) also found that the one-month prevalence of LBP was increased with age (p value <0.001). However Siambanes D. *et al* (2004) found that age was not significantly related to the prevalence of back pain.

Generally LBP has multifactorial causes. Factors that may be related to among schoolchildren are high growth rate, smoking, tight quadriceps femoris, tight

hamstring and working during the school years, walk to and from school and BMI (Feldman D.E. *et al*, 2001; Kovacs F.M. *et al*, 2003; Siambanes D. *et al*, 2004).

2.4 Preventive measures

Everyday schoolchildren have to carry their school material in schoolbag. These schoolbags are filled with books, bottles of water and other items that can create a strain on their growing bodies. Most of the studies have showed that most of these schoolchildren carried heavy load to school. Health professional have voice their concern that heavy schoolbag may be putting schoolchildren at risk of health problem such as LBP. Because of that some centers have started to develop and implement some preventive measures to control the problem. Organization such as American Physical Therapy Association (APTA), American Academy of Pediatric (AAP) and American Occupational Therapy Association (AOTA) had proposed and advice to parents and schoolchildren to limit the schoolbag weight to not more than 15.0% of the child's body weight. Forjuoh F.N. *et al* (2003) reported that many schools have begun to institute measures to limit the weight of the schoolchildren backpack. For example a middle school in Central Texas, U.S has regulated that backpacks are always kept in students' locker and not be allowed into the classroom, thus reducing the carrying of heavy backpack during school hours. While Siambanes D. *et al* (2004) reported that 2 of the schools that were included in their study have already implemented "2 sets textbooks system" with one set provided for home use. This will eliminating the need to carry textbooks to and from school everyday, however this practice was not enforced.

Beside preventive programs being done in school, several non government organization (NGOs) such as American Chiropractic Association (ACA) have placed articles to educate parents and students on the importance of knowing how to use the backpack safely. Important backpack contributing factors of LBP include proper fitting and using safe lifting technique. In United State, American Occupational Therapy Association (AOTA) initiated the National School Backpack Awareness Day, celebrated in September every year. The AOTA helps in research, provide tips for consumer regarding backpack safety and occupational therapy tips for Health campaign in school. They prepared Community Toolkits that help individuals or groups to start planning Backpack Awareness Even in the respective community. Jacobs K. (2002) reported that AOTA has made collaboration with a company called L.L Bean Company to raise the awareness about safe and healthy school backpack use. The L.L Bean Company is a leading retailer of quality apparel and gear such as school backpack for men, women and children who love the outdoors. This collaboration has made the national public information campaign on promoting healthy backpack use with the development of brochure, hang tags on the backpack, video news release, sample talking scripts for presentation and sample press releases for print and broadcast media. The information was aired on 81 local and national broadcast station and placed in 212 local and national newspapers. She also reported that the information reached approximately 23 million people. The campaign informed people that heavy backpack or carried incorrectly may cause significant pain and injury to the growing bodies, and to reduce the risk of injury, parents should monitor the weight of the backpack and how their children load and carry them.

In U.S, a few states have already taking an initiative to limit the weight of the schoolbag. For example California State Assembly has passed a legislation that would force the school districts to develop ways of reducing the weight of the schoolchildren's backpack and similar legislation is being consider in New Jersey. Finally, all parties such as government, school authorities, health professional, parents and schoolchildren have to collaborate for the preventive measures to be successful.

2.5 Research Questions

Due to the limited information and data on the problem of schoolbag and low back pain in Malaysian primary schoolchildren, the purpose of this study is to answer several research questions:

1. What is the average schoolbag load carried by students?
2. What is the ratio between the weight of child and the schoolbag?
3. What is the average schoolbag load in percentage to body weight carried by the students?
4. Which is the common type of schoolbags used?
5. How many (number and percentage) of the students carrying their bag that 15% and above of their body weight?
6. What are the contents of schoolbags weighing more than 15% body weight?
7. What is the prevalence (1-month) of LBP?

CHAPTER 3

OBJECTIVES

3.1 General Objective

To study the weight of the schoolbags, it's association with low back pain among primary school children in Lipis District, Malaysia.

3.2 Specific objectives

- To determine the weight of the schoolbags used by primary school children.
- To determine the contents of heavy schoolbags (more than 15.0% of the body weight) of the primary schoolchildren.
- To determine the prevalence (1-month) of low back pain among the primary schoolchildren.
- To determine the relationship between the schoolbag weight and low back pain in primary schoolchildren.

CHAPTER 4

METHODOLOGY

4.1 Research Area

The study was conducted in Lipis District, Pahang from September to November 2005. Lipis is one of the districts located in west area of Pahang and geographically situated in the middle of West Malaysia.

There were 55 primary schools and nearly all of them are under by the Ministry of Education, with 2 schools under both Jabatan Orang Asli and Ministry of Education. The 55 schools are divided into National type schools 43 (78.2 %), Chinese type schools 6 (11.0 %), Tamil type schools 4 (7.2 %) and National type Orang Asli school 2 (3.6 %).

In 2005, the total enrollment from Primary 1 to Primary 6 schoolchildren in the district were 10710 children. It comprised of 7993 (74.6%) Malays, 1565 (14.6%) Orang Asli, 791 (7.4%) Chinese, and 313 (2.9p%) Indian. There were 5464 (51.0%) male children and 5246 (49.0%) female children.

4.2 Research Design

The study was a cross sectional study conducted on Primary 1 to Primary 5 schoolchildren in Lipis. The reference population was primary schoolchildren in Lipis District, Pahang.

4.2.1 Sampling method

As the schools in Lipis District can be group into types of school, the two-stage cluster sampling was conducted. From 55 available primary schools in Lipis, 16 schools were excluded due to logistic difficulties in accessibility. These schools can only be accessed by helicopter, jungle tracking, trains or boats. And, they only have less than 30 students per school.

In the first stage, the remaining 38 schools were stratified according to the types of school National type school, Chinese type school or Tamil type school.

Table 4.1 Types and number of schools eligible for the study

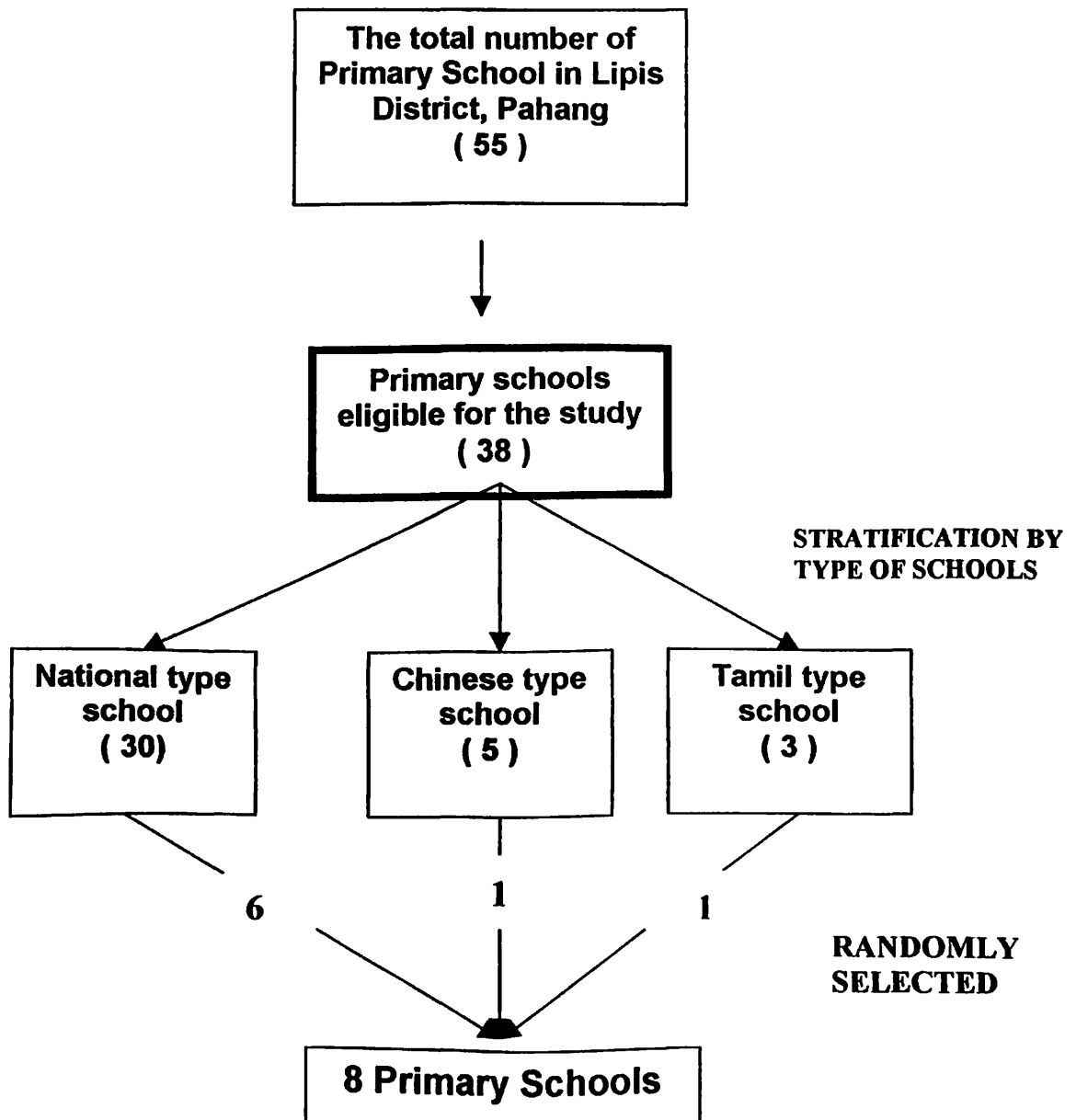
Type of school	Number of school	
	number	Percentage (%)
National School	30	79.0%
Chinese School	5	13.0%
Tamil School	3	8.0%
Total	38	100%

Simple random sampling were applied to each strata in order to select the schools. The number of schools selected in each strata were based on the proportion of each type of school in the district.

Eight schools were selected to meet the sample size of 815 schoolchildren required for the study. Of the 8 schools, six schools were from the National type school and one each from Chinese and Tamil type school.

Only Primary 1 to Primary 5 schoolchildren was sampled for this study. Only one class from each grade was included in the study. All schoolchildren in the selected class on the day of the study were included. If the school have more than one class for each grade, simple random sampling was done to choose the class.

Figure 4.1 Summary of sampling method



Note:

- Only Primary 1 to Primary 5 schoolchildren were selected.
- Only one class from each grade was selected in the study.
- All students in the selected class on the day of the study were included.
- If the school have more than one class for each grade, simple random sampling was done to choose the class.

4.2.2 Criteria for selection

A. Inclusion criteria

- Primary 1 to Primary 5 school children that was registered with Pejabat Pendidikan Daerah Kuala Lipis for the 2005 school session, and present on the day of the study.

B. Exclusion criteria

- Schoolchildren who have history of any back injury, congenital spinal disease and other chronic illness.